Center Independent Research & Development: GSFC IRAD

Novel Ka-band High Gain Antenna Design for Comm Systems for future Earth Observing Missions

Completed Technology Project (2014 - 2016)

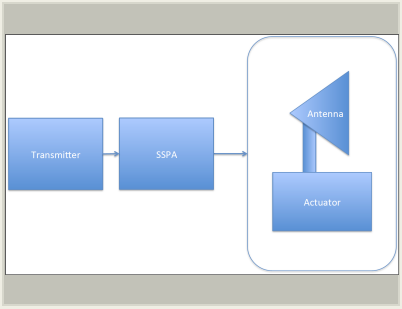
Project Introduction

A novel high gain antenna (HGA) for Ka-band RF communications is proposed in this IRAD. Such a concept is in the best interest for future Earth Observing (EO) missions at Low Earth Orbit (LEO) that have stringent jitter requirements, and where a HGA with a dual axis gimbal seems unacceptable due to the jitter that could be induced to the observatory.

The goal of this proposal is to continue the design effort and increase the technology readiness level (TRL) of a high gain antenna (HGA) for Low Earth Orbit (LEO) Ka-band communications. This design would be radically different to what has been done before for Ka-band LEO communication applications and would be a very elegant and cost efficient solution to the jitter concern. Spacecrafts with very tight stability requirements, such as the Landsat Data Continuity Mission (LDCM), the Joint Polar Satellite System (JPSS), and Ice, Cloud and land Elevation Satellite (ICESat) 2 could benefit from a HGA that exerts virtually no torque or jitter without the added complexity and cost of developing an electronically scanned array. The proposed option would present the benefit of having only a single-axis movement, rather than a 2-axis gimbal system. It would therefore decrease the disturbance to the observatory caused by a traditional HGA pointing system, and still enable higher data rates using less transmit power.

Anticipated Benefits

NASA missions like for example Deformation, Ecosystem Structure and Dynamics of Ice (DESDynI), could benefit from the Ka band allocated bandwidth for data rates in the order of 1 Gbps, which is more than twice of what is available at X-band. This IRAD helps mature one of the possible antenna options that could be used for Earth observing (EO) missions at low Earth orbits (LEO) that cannot afford a high power RF transmitter onboard.



High Gain Antenna Design for Comm Systems

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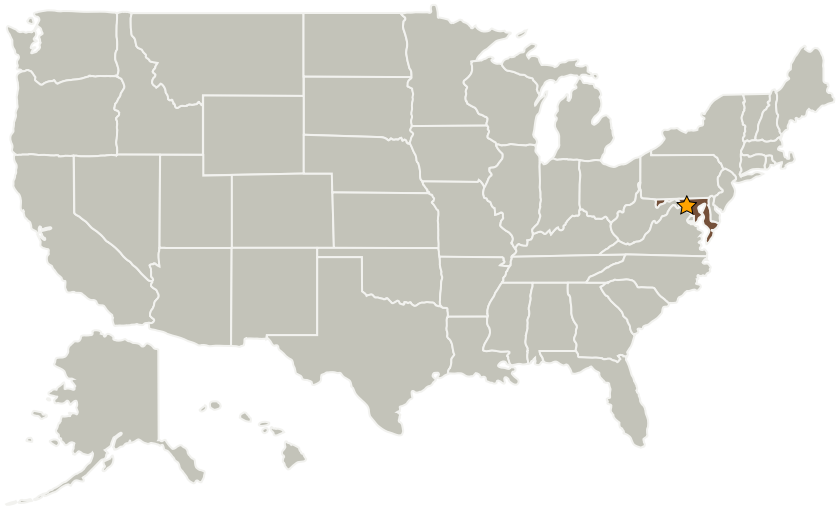
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
ASRC Federal Space and Defense(AS&D)	Supporting Organization	Industry	

Primary U.S. Work Locations
Maryland

Project Transitions

October 2014: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Independent Research & Development: GSFC IRAD

Project Management

Program Manager:

Peter M Hughes

Project Managers:

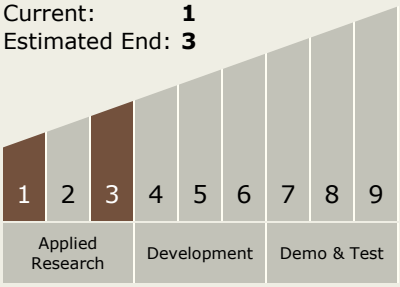
Dennis W Woodfork
Wesley A Powell

Principal Investigator:

Victor J Marrero Fontanez

Technology Maturity (TRL)

Start: **1**
Current: **1**
Estimated End: **3**



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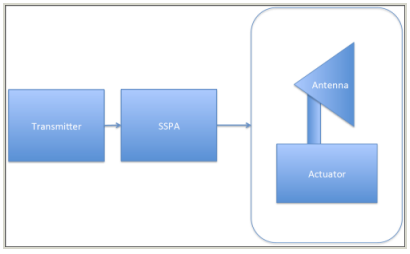
September 2016: Closed out

Closeout Summary: The purpose of the Goddard Space Flight Center's Internal Research and Development (IRAD) program is to support new technology development and to address scientific challenges. Each year, Principal Investigators (PIs) submit IRAD proposals and compete for funding for their development projects. Goddard's IRAD program supports eight Lines of Business: Astrophysics; Communications and Navigation; Cross-Cutting Technology and Capabilities; Earth Science; Heliophysics; Planetary Science; Science Small Satellites Technology; and Suborbital Platforms and Range Services. Task progress is evaluated twice a year at the Mid-term IRAD review and the end of the year. When the funding period has ended, the PIs compete again for IRAD funding or seek new sources of development and research funding or agree to external partnerships and collaborations. In some cases, when the development work has reached the appropriate Technology Readiness Level (TRL) level, the product is integrated into an actual NASA mission or used to support other government agencies. The technology may also be licensed out to the industry. The completion of a project does not necessarily indicate that the development work has stopped. The work could potentially continue in the future as a follow-on IRAD; or used in collaboration or partnership with Academia, Industry and other Government Agencies. If you are interested in partnering with NASA, see the TechPort Partnerships documentation available on the TechPort Help tab. http://techport.nasa.gov/help

Images



High Gain Antenna Design for Comm Systems
High Gain Antenna Design for Comm Systems
(https://techport.nasa.gov/image/36876)

Project Website:

http://aetd.gsfc.nasa.gov/

Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.2 Radio Frequency
    - TX05.2.6 Innovative Antennas